Age−dating of groundwater inflow to the San Joaquin River

Robert L Michel

Public Comments

No public comments were received for this proposal.

Initial Selection Panel Review

Proposal Title

#0185: Age−dating of groundwater inflow to the San Joaquin River

Funding:

Do not fund

Initial Selection Panel (Primary) Review

Topic Areas

- Environmental Influences On Key Species And Ecosystems
- Processes Controlling Delta Water Quality
- Implications Of Future Change On Regional Hydrology, Water Operations, And Environmental Processes

Please describe the relevance and strategic importance of this proposal in the context of this PSP. How does the proposal address the topic areas identified above? What are the broader CALFED Goals this proposal may meet that are not accounted for in these specific topic areas?

The information sought could be valuable for planners. It should be valuable for planners to understand how long pollutants already in the system will take to work themselves out given that inputs are modified in the future. On the other hand, the study results will not identify any new problems or any new solutions to existing problems. It is also not clear to me that groundwater contributions are a major component of loading to the San Joaquin River. Thus, the information would be valuable, but not immediately essential

The budgets of proposals submitted in response to this PSP are larger, on average, than those submitted to CALFED in previous years. The Science Program is committed to getting as much science per dollar as is reasonably possible. With this commitment in mind, can the proposed budget be streamlined? If so, please recommend and clearly justify a new budget total in the space provided.

No basis to suggest a change

Evaluation Summary And Rating.

Provide a brief explanation of your summary rating and any additional comments you feel are pertinent.

The project is interesting and could be useful in the long term. However, in light of other CALFED critical priorities and the limited funding available, I don't believe that CALFED can justify spending money on this project at this time.

Selection Panel (Discussion) Review

fund this amount: $**0**
note:
do not fund

This work proposes to estimate age of groundwater flows entering the San Joaquin River. The relevance is to answer the question of how long the system would take to respond to cleanup of groundwater pollutants. It has clear linkages to management, although other studies proposed are of higher priority.

There has been a fair amount of work on this topic in the San Joaquin, so this would not be breaking completely new ground. The proposal does not clearly put the proposed work in the context of the existing literature and previous work.

These are talented scientists with state of the art capabilities and techniques. This work would cost about twice the budgeted amount, if not for USGS salary cost sharing. Some of the panel felt the relation of land use practices to contaminants had important implications to management. However, overall, the panelists felt that these project issues were less pressing than other issues raised in other proposals.

Panel Ranking: Do not fund.

Technical Synthesis Panel Review

Proposal Title

#0185: Age−dating of groundwater inflow to the San Joaquin River

Final Panel Rating
above average

Technical Synthesis Panel (Primary) Review

TSP Primary Reviewer's Evaluation Summary And Rating:

Two of the technical reviewers rated most aspects of this proposal as good to fair; however, the third reviewer considered it to be excellent in all of the rating categories. All three seemed to agree that the goals, and objectives were clear and internally consistent, but one of the reviewers felt that the hypothesis is not well−posed due to ambiguity in water quality data that will likely prevent rejection of multiple, alternative hypotheses. The reviewers also all agreed that the study team has an exceptional track record for this type of research, and that the proposed budget is reasonable. One reviewer felt that more effort should have been made to demonstrate that the proposed methods are suitable for this specific study area prior to funding the larger effort. A conceptual model of the flow sources or pathways and their geographic variability would improve the proposal. The reviewers generally felt that the approach is feasible and the resulting data will add to the base of knowledge, although it was suggested that other geochemical approaches might prove to be more useful. The products from the proposed work, if successful, will provide useful information; however, one reviewer felt that a flow model that is consistent with the geochemical data and more evaluation of model uncertainties would improve the study.

Additional Comments:

Two of the technical reviewers rated most aspects of this proposal as good to fair; however, the third reviewer considered it to be excellent in all of the rating categories. All three seemed to agree that the goals, and objectives were clear and internally consistent, but one of the reviewers felt that the hypothesis is not well−posed due to ambiguity in water quality data that will likely prevent rejection of multiple, alternative hypotheses. The reviewers also all agreed that the study team has an exceptional track record for this type of research, and that the proposed budget is reasonable. One reviewer felt that more effort should have been made to demonstrate that the proposed methods are suitable for this specific study area prior to funding the larger effort. A conceptual model of the flow sources or pathways and their geographic variability would improve the proposal. The reviewers generally felt that the approach is feasible and the resulting data will add to the base of knowledge, although it was suggested that other geochemical approaches might prove to be more useful. The products from the proposed work, if successful, will provide useful information; however, one reviewer felt that a flow model that is consistent with the geochemical data and more evaluation of model uncertainties would improve the study.

Technical Synthesis Panel (Discussion) Review

TSP Observations, Findings And Recommendations:

The proposed research is feasible and addresses important questions. It should result in useful information, and the team has the capabilities necessary to perform the research. Regarding this proposal, the technical reviewers reached different conclusions. The more favorable review provided only minimal substantiation of the review's conclusions. The primary reviewer (from the panel) rated the proposal as adequate, but after discussion by the entire panel a rating of avove average was agreed upon., The panel did not think that the any of the comments in the less favorable review

identified significant concerns. Some sections of the proposal were either not well described or developed and hindered evaluation of the technical and scientific value of the proposed research. One reviewer found that the conceptual model was not sufficiently developed. Another thought: a flow model would be an important addition.

Technical Review #1

proposal title: Age−dating of groundwater inflow to the San Joaquin River

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	**The clearly stated goal of the work proposed is to determine the time scale for influx of shallow water and entrained contaminants into the San Joaquin River. The series of objectives leading to this goal are also clearly presented and are based on internally consistent hypotheses regarding the processes by which contaminants invade shallow groundwater systems and through them enter the river. The information provided by the project will allow managers and stakeholders to determine the time it will take for their efforts to ameliorate pollution of the shallow aquifers to be evident in the river. This time may be in years or decades and it will be important to be aware of it so as not to mislead stakeholders with promises of quick clean−up times.**
Rating	**excellent**

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full−scale implementation project justified?

Comments	**The study will expand on existing knowledge of the San Joaquin river system and the known**

	interactions of groundwater with river systems elsewhere. The basis of the work proposed is fully consistent with the clearly−explained conceptual model. The research proposed is the application to the San Joaquin River system of techniques successfully demonstrated elsewhere. It would be done in conjunction with three programs of monitoring work by two participants in this projects that have already been approved by CALFED.
Rating	**excellent**

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	**The stepwise approach proposed is well designed and appropriate to achieve the program objectives. The techniques to be applied have been tested elsewhere and successfully achieve the objectives sought in this program. The information on groundwater residence times and pollutant sources are not presently available. The results will be important to decision makers in that they will provide a means to determine the time it will take the river system to respond to pollution abatement measures undertaken in its drainage basin.**
Rating	**excellent**

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	**The program comprises nine tasks, all clearly documented so they can be fully evaluated. The tasks include assembling historical data, selection of sampling sites, collection and analysis of samples, interpretation of historical and collected data to yield groundwater ages and pollutant loads and sources, communication of results, particularly the time scales over which alternate management strategies may become effective, and the publication of results to the broader scientific community. The likelihood of overall success is high because the approaches to the individual tasks have been successfully applied to similar problems elsewhere by the individuals who will perform the work for this program. These individuals have a history of successful completion of programs of programs of similar complexity.**
Rating	**excellent**

Monitoring

If applicable, is monitoring appropriately designed (pre−post comparisons; treatment−control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	**Monitoring activities are not part of this proposal, but the work proposed will make use of the results of monitoring data to be collected by several of the project participants in three other funded CALFED projects.**
Rating	**excellent**

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	**The study will produce information on the residence times of shallow groundwaters entering the San Joaquin**

	River which will be communicated with managers and stakeholders and displayed for broad scientific review and comment through publications in the open literature. The information is important to managers in that it will allow them to judge the times that will be needed for the effects of pollutant abatement measures proposed within the basin to become evident in the properties of the river itself. Groundwater residence times may be long enough that response times could be measured in decades. If this is the case, it would be well to know it up front to avoid raising false hopes that cleanup could be rapid. The program proposed combines several investigative and interpretative techniques that have been successfully applied elsewhere by participants in this proposal. Thus, it is highly probably that the anticipated results will be achieved.
Rating	excellent

Additional Comments

Comments

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	The project team comprises scientists and technicians from the U. S. Geological Survey who will perform most of the field work and laboratory analyses and provide the data interpretation and reporting. It also includes personnel from North Carolina State University and the University of Bremen, subject experts in several of the analytical techniques to be applied. The track records particularly of the Lead Investigator Robert Michel and the two senior supporting USGS

	scientists Carol Kendall and L. N. Plummer are outstanding. All have histories of successful completion of interdisciplinary projects of at least equal complexity to this one. All are widely respected experts in the fields of groundwater age determinations, the use of stable isotopes for pollutant source studies and the interpretation of such data in terms of river pollutant loading. The infrastructure of the USGS and the laboratories of the additional collaborators are more than sufficient for this program.
Rating	**excellent**

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	**The budget is reasonable and adequate. The costs of the sampling and analytical work are reasonable. The amounts of personnel time requested are justified by the tasks proposed and are not excessive.**
Rating	**excellent**

Overall

Provide a brief explanation of your summary rating.

Comments	**It is highly recommended that this program be funded. The groundwater residence time information it promises will be important to managers by allowing them to provide realistic estimates of the response time of the river to abatement measures proposed in the basin. The proposal is clearly written so it can be fully evaluated. The program has a very high probability of success because it comprises the application of techniques that have been**

	successfully demonstrated in other projects by scientists with proven track records in project management and expertise in their fields. The requirements of this project will not strain the infrastructures of the supporting organisations. The budget is sufficient without being excessive.
Rating	**excellent**

Technical Review #2

proposal title: Age−dating of groundwater inflow to the San Joaquin River

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	**The goals and objectives, although somewhat lofty, are clearly stated. The proposal addresses issues that are both timely and important to sustainable development of the region. The historical goals seem reasonable and justified. The notion of calculating future contaminant discharges, especially under different land use scenarios seems overstated considering that partitioning of the basic water sources in the system has first to be quantified. The impact of climate change on water fluxes is neglected.**
Rating	**fair**

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full−scale implementation project justified?

Comments	**Yes. An improved understanding of the water cycling processes and interactions in the San Joaquin River Basin is of critical importance. No detailed conceptual model of flow sources or pathways or geographical variability is included. This would improve the overall proposal. No detailed conceptual description of mean residence time is included. This**

	should be related to the age spectrum of the full mixture of groundwater and surface water. The further conceptual linkage from solvent to solute and contaminants (nitrate) is not clearly made. As this project augments ongoing research, the scope of the proposal seems justified as presented.
Rating	**fair**

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	**I agree that the application of isotope tracers is an appropriate plan to improve understanding of the role of groundwater in the water cycle budget. I think the project is likely to generate novel information relevant to better understanding of the San Joaquin system, and therefore will be useful to decision makers.**
Rating	**good**

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	**The approach has been used elsewhere and is technically feasible. Success in achieving an historical/contemporary assessment of mean residence time is likely. I am more skeptical about achieving the goals related to future prediction. Furthermore, the relation between nitrate and water source may not be resolved by looking at mean residence times.**
Rating	**fair**

Monitoring

If applicable, is monitoring appropriately designed (pre−post comparisons; treatment−control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	**Monitoring is appropriately designed and plans to interpret the monitoring data form an integral part of the proposal.**
Rating	**good**

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	**Yes. The project is likely to yield an important knowledgebase of information, including peer reviewed scientific articles, that will be useful for decision makers.**
Rating	**good**

Additional Comments

Comments	**I am not sure what supplementary information may have been contained in the additional 3 funded CALFED proposals named herein. My judgement is based upon this as a stand−alone contribution.**

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	**The authors' are capable researchers with renouned track records. The team is very qualified to effectively implement the historical/contemporary analyses proposed. They have adequate infrastructure**

	and related support.
Rating	**very good**

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	**The budget is modest and perhaps understated, but the work is being carried out by very capable, experienced researchers from established organizations with considerable in-kind resources at hand. I am sure that they will deliver and thus are asking only for the monetary support that they require to complete the project objectives.**
Rating	**good**

Overall

Provide a brief explanation of your summary rating.

Comments	**This proposal outlines an important plan to improve understanding of water sources and the nitrate dilemna in the San Joaquin River Basin. I recommend the study for funding if resources permit, and encourage the authors' to invest some time/resources into development of a better conceptual/quantitativ model of the basin linking the water, solute, and contaminant processes.**
Rating	**good**

Technical Review #3

proposal title: Age−dating of groundwater inflow to the San Joaquin River

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	**The specific goals and objectives of the proposed research are clearly stated and appear to be consistent. The idea is timely and important. I do not believe, however, that the stated hypothesis is well−posed. There is commonly great ambiguity in water quality data, such that multiple, alternative hypotheses can not be rejected. There does not appear to be any linkage to flow modeling, either static or dynamic. It appears that a CSR (mixed) system will be assumed. The emphasis on water quality signatures to the exclusion of flow modeling is troubling. A more robust hypothesis would consist of evaluating existing flow models using the water quality data as validation criteria.**
Rating	**fair**

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full−scale implementation project justified?

Comments	**The existing knowledge is well documented, and the underlying basis for the proposed work is well described. It appears, however, that no effort has been made to evaluate whether the proposed methods are suitable for the location of interest. At a minimum,**

	existing data should be presented that provide some indication of the success of the proposed methodology. Instead of funding a large sampling program that may not succeed, a more focused evaluation should be performed first to evaluate which of the proposed methodologies, if any, might be suitable.
Rating	**fair**

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	**The approach is very well described. The results of the study, if successful, will be novel and of great value to decision−makers. However, it may be that alternative geochemical approaches might be more useful, i.e., developing alternative conceptual flow models that use geochemical information to evaluate which of the alternative models are most likely to correctly describe the physical system.**
Rating	**good**

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	**It is unclear whether this approach will provide tangible results. Analysis of existing data, or the collection of a targeted sample, is required to evaluate the feasibility of the proposed approach.**
Rating	**fair**

Monitoring

If applicable, is monitoring appropriately designed (pre−post comparisons; treatment−control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	**The monitoring program appears to be well−designed. It is unclear, however, how the study will incorporate a priori water quality data. It may be that other, currently available water quality data (e.g., specific conductance, temperature, etc.) might be used to define the flow system. Also, monitoring locations might be selected based on hydrologic modeling studies, i.e., where models predict the flow to be most likely. Divorcing the physical transport processes from the geochemical sampling and monitoring effort is not likely to be as useful as a monitoring strategy that fully utilizes available information.**
Rating	**fair**

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	**The products from the proposed research, if successful, will clearly provide useful information of high value. Unfortunately, with every geochemical investigation, there are residual uncertainties related to the conceptual model employed, making a definitive indentification of sources and response to management intitiatives problematic. Greater attention to model uncertainties should be performed. A clearly stated flow model that is consistent with the geochemical data would**

	provide a more useful management tool.
Rating	fair

Additional Comments

Comments	The proposal appears to be linked to two existing research initiatives. It is not clear from the proposal the degree of overlap between the proposed scope of work and the existing research. I would suggest that the existing research be more clearly linked to the proposed scope of work, and that the existing research be used to more completely frame the flow models, both in terms of hydrology and the types of geochemical approaches proposed.

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	The track record is superb. The team is clearly exceptional and well-qualified. There can be no doubt that the technical capabilities of the team are unequaled.
Rating	excellent

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	The budget is reasonable for the scope of work proposed. Yet I have grave concerns that the results may not provide the required information, and any conclusions from the data may not be appropriate. I strongly urge the investigators to demonstrate that these approaches have merit for the specific system

	that is to be investigated.
Rating	**good**

Overall

Provide a brief explanation of your summary rating.

Comments	**There are many positives for this proposal. Excellent technical capabilities, a modest budget, promising techniques, and an important topic. Yet I have great concerns due to the lack of confirmation that the proposed techniques are appropriate for the study area, the failure to incorporate hydrologic modeling with the geochemical investigation, and the ambiguity associated with fitting the data to a simple mixing model. Greater effort should be made in 1) collecting trial data to show that a geochemical signature is present, 2) developing alternative flow and transport models that make a priori predictions of expected geochemical outcomes, and 3) analysis of uncertainties related to the type of geochemical mixing scenarios employed.**
Rating	**fair**